A CALL ACCESS CONTROL METHOD

Field of the Invention

The present invention relates to a method of dynamic allocation of radio channel resources in mobile communication field, particularly to a call access control method during call initiation or cell switching in TDD CDMA mobile communication system.

Background of the Invention

For 3G mobile communication systems, the call access control policy put forth in the standard document mainly uses a concentrated call access control algorithm in RNC to allocate channel resources according to the current load of the communication system as well as QoS demands of the calling subscriber. Since the processing and implementation of the concentrated call access control algorithm is in the RNC, which is on a higher level in the mobile network hierarchy, sophisticated signaling support between RNC and UE and between RNC and Node_B in the system is required. Therefore, the algorithm is complex in operation and difficult to implement.

Summary of the Invention

An object of the present invention is to provide a simple and effective call access control method based on counting of accessed subscriber, to implement dynamic allocation of channel resources of the base station.

The technical solution of the present invention is applicable to call access control during call initiation and cell switching, comprising the following steps:

1) counting the number of accessed subscribers in all current communication time slots of the home base station for an access

request, to determine channel resource occupations in different time slots;

2) comparing said channel resource occupations in the different time slots, and then allocating idle resource units in the time slots having available channel resources and the minimum number of accessed subscribers to the subscriber sending the access request.

In said technical solution:

Said access request is a call access request sent from a new mobile subscriber to the home base station or a call switching request sent from a mobile subscriber to its adjacent cells.

Said counting in step 1) refers to: arranging corresponding counters for different time slots respectively, so that the number of counters are equal to the maximum number of communication time slots that can be supported by the base station; counting accessed subscribers in the time slots, and increasing the corresponding counter by 1 if the current resource unit is occupied; otherwise increasing it by 0.

Step 2) comprises:

a) comparing channel resource occupations in all uplink time slots, and allocating the idle resource unit in uplink time slots having available channel resource and the minimum number of accessed subscribers to the new subscriber sending the access request as an uplink channel; if the idle resource unit is allocated successfully, going to step b), otherwise going to step c);

b) comparing channel resource occupations in all downlink time slots, and allocating the idle resource unit in downlink time slots having available channel resources and the minimum number of accessed subscribers to the new subscriber sending the access request as a downlink channel;

c) returning a response signal to the call access request

according to the channel resource allocations in the uplink and downlink time slots.

Step a) comprises:

comparing all counters storing the count value of accessed subscribers in the uplink time slots one by one, and selecting a counter with the minimum count value in the uplink time slots;

comparing said count value in the counter with the threshold (i.e., the maximum number) of subscribers to be accessed per time slot supported by the base station; if the count value stored in the counter is smaller than the threshold, allocating an idle resource unit in the uplink time slots corresponding to the counter as an uplink channel to the new subscriber sending the access request; otherwise indicating the failed allocation.

Step b) comprises:

comparing all counters storing the count value of accessed subscribers in the downlink time slots one by one, and selecting a counter with the minimum count value in the downlink time slots;

comparing said count value in the counter with the threshold (i.e., the maximum number) of subscribers to be accessed per time slot supported by the base station; if the count value stored in the counter is smaller than the threshold, allocating an idle resource unit in the downlink time slots corresponding to the counter as a downlink channel to the new subscriber sending the access request; otherwise indicating the failed allocation.

Step c) refers to: when the channel resources in the uplink and downlink time slots are both allocated successfully, returning a message to the mobile station sending the access request to indicate the succeeded access, or returning a message to the mobile station sending the cell switching request to indicate the succeeded cell switching; otherwise returning a message to the mobile station

sending the access request to indicate the failed access, or returning a message to the mobile station sending the cell switching request to indicate the failed cell switching.

The threshold (i.e., the maximum number) of subscribers to be accessed per time slot supported by the base station is 6~8, and is determined during initialization.

Compared with the concentrated call access control algorithm implemented in the RNC at higher level, the method of the present invention is implemented in the home base station processing a call access request sending from a subscriber, and the allocation of channel resources can be performed flexibly in a local area, simplifying signaling switching greatly. The implementation of the method is relatively simple and doesn't require complex operation. With the method, channel resources with lower system interference may be allocated dynamically to subscribers sending the call request. Since the present invention also takes account into interference from other cells and maintains an effective call access control (CAC) threshold N, so as to reduce interference of new subscribers to the system and guarantee QOS demand of subscribers to be accessed; therefore, it can improve system capacity effectively.

Brief Description of the Drawings

Fig. 1 is a flow chart of the call access control method of the present invention.

Detailed Description of the Embodiment

The embodiment is described taking the access call initiated by a new mobile subscriber to the home base station as an example.

The method of the present invention comprises: counting the

number of accessed subscribers in all current communication time slots of the home base station for an access request, to determine channel resource occupations in different time slots; then comparing said channel resource occupations in the different time slots, and then allocating idle resource units in the time slots having available channel resources and the minimum number of accessed subscribers to the subscriber sending the access request. Therefore, dynamic allocation of base station channel resources can be implemented.

For example, in the low data rate (1.28Mchips) TD-SCDMA mobile communication system as shown in Fig.1, it is set that there are totally 7 uplink and downlink time slots available for communication. When the flow shown in Fig.1 is applied to a high data rate (3.84Mchips) TDD system, the total number of uplink and downlink time slots may be modified to 15; C_{ij} in the flow chart represents the state of current channels being searched (may be 0 or 1, 0 for idle, and 1 for occupied); TS_i represents time slot number; S_{TSi} represents the counter used to count accessed subscribers corresponding to time slot TS_i; N represents the threshold (i.e., the maximum number) of subscribers to be accessed per time slot.

A sub-frame in TD-SCDMA comprises 7 time slots for communication, which are used to transfer uplink (UL) and downlink (DL) traffic; according to a protocol, a time slot can support up to 16 subscriber channels simultaneously; thus a carrier frequency/time slot/channel constitutes a resource unit (RU); under interference from other cells, the Call Access Control (CAC) access threshold N (i.e., the maximum number) of subscribers to be accessed in a time slot must be smaller than the maximum number of channels that are supported in a current time slot. As a design parameter, threshold N may be adjusted as required in system design

(6~8 is preferred) and is determined during initialization.

Please see the flow chart shown in Fig.1, when a new subscriber is to be added, the home base station that receives the access request searches the state of channel resources in the 7 time slots and performs counting for channel occupation in all uplink and downlink time slots. Corresponding counters is arranged for different time slots and stores the subscriber counting result. If a resource unit is occupied currently, it increases the counter by 1; if the resource unit is idle, it increases the counter by 0. After obtaining the statistical results, the base station compares the statistical results in the uplink (UL) time slots, and, on the premise that the counter value is lower than the Call Access Control (CAC) access threshold N, it allocates the channel resource unit in the uplink time slots with the minimum count value as an uplink channel resource to the requesting subscriber. After the uplink channel resource is allocated successfully, it controls the allocation of channel resource in downlink time slots. It compares the statistical result in downlink (DL) time slots, and, on the premise that the counter value is lower than the Call Access Control (CAC) access threshold N, it allocates the channel resource unit in the downlink time slots with the minimum counter value as a downlink channel resource to the requesting subscriber, so that the time slots with the minimum co-channel interference are allocated to the new calling subscriber, to implement dynamic radio resource allocation.

In allocation principle described above, the Call Access Control (CAC) is successful only when both uplink and downlink meet the constraint conditions, and in this case, the base station will return a message to the requesting mobile station to indicate the access is successful; otherwise the base station will return a

message to the requesting mobile station to indicate the failed access. In the call access control method of the present invention, the selection of the threshold N of subscribers to be accessed is crucial; the base station that performs resource searching and allocation must maintain an effective CAC access threshold N; whereas the threshold (i.e., the maximum number) of subscribers to be accessed per time slot N is the result of compromising between GoS (Grade Of Service) and QoS (Quality Of Service). Under interference from other cells, the threshold N of subscriber to be accessed must be lower than the maximum number of channels that can be supported by the current time slot.

The method of the present invention is applicable to not only the access call of a new subscriber but also the switching call between adjacent cells; whatever the call is, it involves searching for and allocating channel resources and has no essential difference in regard to the call access control (CAC) principle. When a mobile subscriber in calling moves into an adjacent cell, the home cell changes. To meet the requirement for call quality and level, the mobile subscriber will send a switching call request to the current home cell; when receiving the switching call request, the current home cell executes the same method and steps as those for the access call of a new mobile subscriber initiated to a home base station; if the channel resources are allocated successfully, the home base station returns a message to the mobile subscriber to indicate the succeeded switching call access; otherwise it returns a message to indicate the failed switching call access.